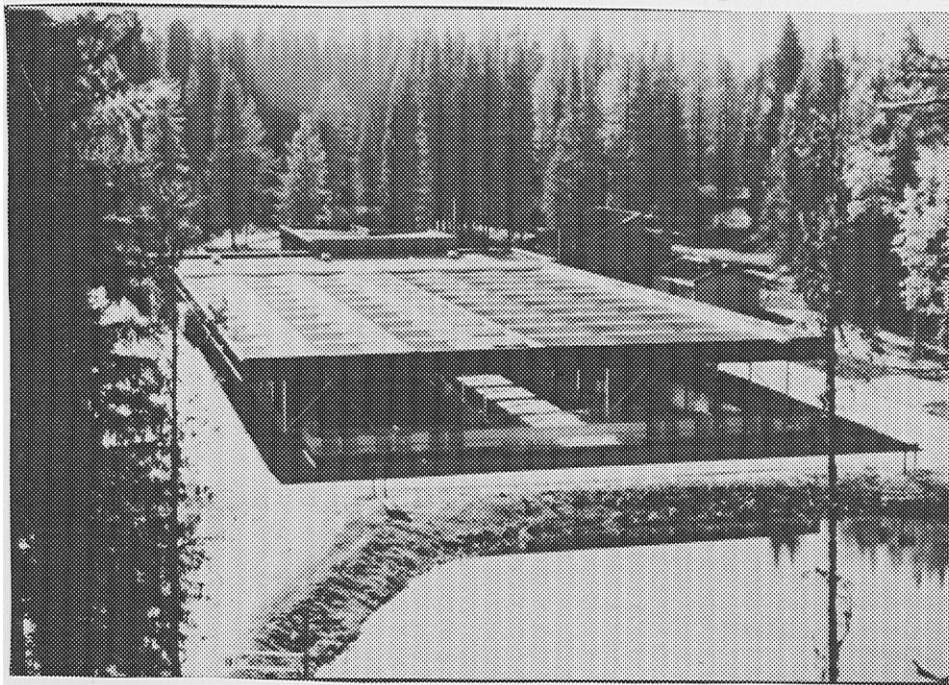




MCCALL FISH HATCHERY

1992 Summer Chinook Salmon Brood Year Report



by

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ABSTRACT

The South Fork Salmon River weir and trap were installed on June 3, 1992, and removed at the conclusion of trapping on September 4, 1992.

Chinook salmon Oncorhynchus tshawytscha spawning at the trap commenced on August 7 and concluded on September 4, 1992. A total of 2,848 returning chinook salmon were trapped, measured, and recorded during this period. The overall average eye-up from eggs taken was 86%, with a total survival to release of 74.2%.

Of the 2,848 fish trapped, 1,151 were females of which 528 were ponded, 623 were released upstream of the weir, 100 were trucked to the Stolle Meadows area, and 103 died in the pond for a pre-spawn mortality rate of 19.5%. There were 1,492 adult males trapped of which 638 were ponded, 854 released upstream of the weir, 100 transported to the Stolle Meadows area, and 115 died in the pond for a pre-spawn mortality rate of 18%. There were 205 jacks trapped (according to length frequency criteria), 87 were ponded, 118 were released upstream, and 7 were trucked to Stolle Meadows. There were 15 that died in the pond for a pre-spawn mortality rate of 17.2%. The higher than normal pre-spawn mortality can be attributed to a severe thunderstorm resulting in heavy suspended silt inundating the holding ponds for several days.

From the 528 females ponded, 325 were spawned, 7 were culled due to visual Bacterial Kidney Disease (BKD) symptoms. There were 1,428,819 eggs kept from 318 females for an average fecundity of 4,493 eggs per female.

During the month of April 1994, there were 1,060,163 brood year 1992 smolts weighing 40,665 pounds transported and released at Knox Bridge on the South Fork Salmon River.

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INTRODUCTION

McCall Fish Hatchery was built in 1979 as a result of the Water Resources Development Act enacted by Congress in 1976. A portion of this act is the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP). The LSRCP compensates Idaho for fish and wildlife losses caused by the Lower Snake River Projects (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams). The McCall Hatchery was the first hatchery built as a partial fulfillment of the LSRCP. Funding for LSRCP is administered to the Idaho Department of Fish and Game (IDFG) by the U.S. Fish and Wildlife Service.

The McCall Hatchery is located within the city limits of McCall, Idaho along the North Fork of the Payette River, approximately 0.16 km (1/4 mile) downstream from Payette Lake.

A satellite facility for trapping and spawning adult chinook salmon Oncorhynchus tshawytscha is located on the South Fork Salmon River near Warm Lake, approximately 26 miles east of Cascade, Idaho.

The main production for McCall Fish Hatchery is summer chinook reared to smolt size. There is also a resident trout program funded solely by IDFG.

The first salmon reared at the McCall Fish Hatchery were transferred in from the Mackay Fish Hatchery and the Dworshak/Kooskia National Fish Hatchery complex. These eggs were the product of adult summer chinook trapped at Little Goose and Lower Granite dams. The first eggs from the South Fork of the Salmon River were received in August of 1980.

OBJECTIVES

The mitigation goal is to return 8,000 adult summer chinook salmon above Lower Granite Dam. The objectives of the McCall Fish Hatchery are:

1. Restore summer chinook salmon to the South Fork Salmon River; historically a major summer chinook stream in Idaho.
2. Trap and spawn adult salmon returning to the South Fork Salmon River.
3. Raise 1,000,000 summer chinook smolts for release into the South Fork Salmon River.
4. Work with management and research to identify optimum operating procedures for the McCall Hatchery.

FISH REARING FACILITIES

The hatchery facility consists of six buildings on approximately 15 acres. The largest building consists of a shop, parking garage, incubation and early rearing area, generator room, and feed/freezer room. The office and a three bedroom dormitory are contained in one building. There is a visitor center with restrooms, a flow chart for a self guided tour, and historical information signs. There are three residences for permanent personnel also located on the site.

The fish production facilities include:

1. Twenty-six 8-tray stacks of FAL (Flex-A-Lite, Consolidated) vertical flow (Heath type) incubators.
2. Fourteen concrete vats 4-ft x 40-ft x 2-ft (water depth); 320 cubic feet of rearing area per vat.
3. Two concrete rearing ponds 196-ft x 40.5-ft x 4-ft (water depth); 23,814 cubic feet of rearing space per pond.
4. One concrete collection basin 101-ft x 15-ft x 4-ft (water depth). The hatchery is designed to raise a maximum capacity of 1,000,000 smolts, averaging 17 fish per pound.

An adult trapping and spawning facility is located on the South Fork of the Salmon River near Warm Lake. This facility is equipped with a removable weir, fish ladder, trap, two adult holding ponds (10-ft x 90-ft), and a covered spawning area. Water is supplied from the South Fork Salmon River through a 33-inch underground pipeline. Holding capacity for the facility is approximately 1,000 adult salmon. Some adults are passed above the weir to spawn naturally. An additional group is transported to Stolle Meadows for Idaho Supplementation research. Eggs collected at the facility are transported "green" to McCall for incubation and rearing.

WATER SUPPLY

Hatchery water is obtained by gravity flow from Payette Lake through a 36-inch underground pipeline. Water may be taken from the surface or up to a depth of 50 feet, thus providing the capability of obtaining optimum rearing water temperatures.

Through an agreement with the Payette Lake Reservoir company, 20 cubic feet per second (cfs) of water flow is available for hatchery use. Design criteria and production goals were established using this constraint, ensuring the hatchery has enough water to meet its production goals.

Water quality analysis reveals a somewhat "distilled" system for rearing fish (Appendix H). Total hardness ranges from 6.3 to 7.06 mg CaCO₃/l, while pH stays about 6.8. There is no indication of problems with heavy metals and temperature is maintained at 52°F to 56°F, with a low of 37°F.

STAFFING

The hatchery is staffed with three permanent employees: a Hatchery Superintendent III, a Hatchery Superintendent I, and a Fish Culturist. In addition there are four temporary employees to assist during the busy field season.

TRAPPING AND SPAWNING

The weir and trap on the South Fork Salmon River was installed and operational on June 3, 1992, and trapping continued through September 4, 1992. Dropping stream flows prompted earlier than normal weir installation. The fish started arriving almost a month early; also, the first fish were trapped on June

5. Normal trap installation is usually around June 20 with the fish arriving shortly thereafter. The peak of the run for 1992 was June 25.

There were 2,848 fish trapped; 1,151 (40%) were females, and 1,697 (60%) were males. A total of 205 male fish (12%) were jacks (3-year-old-fish) according to length frequency criteria. There were 623 females, 854 adult males, and 118 jacks released upstream of the weir. There was an additional 100 pair of adult fish and jacks transported to the Stolle Meadows area and released. These fish were tagged with Peterson disc tags for observation and spawning distribution information.

From the 2,848 fish trapped, there were 652 snouts removed from adipose-clipped fish indicating coded wire tags (CWT). These were sent to the lab in Lewiston, Idaho, for tag removal.

The age class determination by length frequency was used at the trap site during initial trapping. The CWT recovery data and scale analysis show an overlap of age classes originally determined using length frequency. (Table 1).

Table 1. Age distribution of 1992 summer chinook salmon returns to McCall Fish Hatchery, South Fork Salmon River, based on CWT data* and length frequency data.

Age	Males		Females	
	CWT* estimate	Length/ frequency estimate	CWT* estimate	Length/ frequency estimate
3	178	204	0	1
4	1,519	1,503	1,141	1,115
5	0	19	10	6
Totals	1,697	1,726	1,151	1,122

* CWT data based on 601 tags recovered from 653 snouts and expanded for the entire run. Length data is taken at trapping prior to first sort.

Age class breakdown

66 cm< = 3-year-olds, jacks
 67 cm - 89 cm = 4-year-olds
 90 cm> = 5-year-olds

Fork lengths were taken on all of the fish trapped, and all of the adult fish were injected with Erythromycin (Erythro 200). There were two different dosages tested; 30 fish received a 0.4 cc injection and 30 received a 0.67 cc injection. Fish were monitored for drug toxicity and increased mortality, but no indications were noted. The remainder of the adults received a 0.4 cc dosage.

Pre-spawn mortality for the females was 19.5%, with 18% for the adult males and 17.2% for the jacks. A portion of the mortality is directly attributed to

the severe thunderstorm event on June 25. A stream upstream of the facility "blew out" due to excessive rain and hail, causing extremely heavy suspended silt loads in the river and subsequently in the holding ponds. There was an initial loss of 21 males and 21 females, followed by delayed mortality of another 21 females and 15 males. Of the 42 fish trapped containing radio transmitters and jaw tags, installed by University of Idaho personnel, 29 fish (69%) had badly damaged or broken jaws and died prior to spawning. All these factors contributed to a mortality rate higher than anticipated.

Spawntaking activities started on August 7 and finished on September 4, 1992. There were eight spawn days during this period. A total of 1,428,819 green eggs were taken from 318 females for an average fecundity rate of 4,493 eggs per female. There were seven additional females spawned and culled due to visual Bacterial Kidney Disease (BKD) symptoms. A total of 295 adult males and 30 jacks were used in the spawning operation. All eggs taken were water-hardened for one hour in a 200 ppm titrateable iodine solution prior to being transported to the hatchery. The fecundity rate is estimated at 4,500 eggs per female until the eye-up stage is reached and the eggs are enumerated. At eye-up, the eggs are shocked by siphon, picked with an electronic picker, and enumerated by displacement and an electronic counter. The overall eye-up percentage was 86%, or 1,220,600 eyed eggs.

There were nine females spawned without being bled first to compare egg survival with eggs from bled females to try to eliminate the need for cutting the tails. Besides the safety hazard involved with tail cutting, this procedure could be visually offensive to the public. It was determined that there was no measureable difference in egg mortality between the two groups. Additionally, another experiment was conducted comparing river water with well water used for hardening and rinsing of eggs, but no measureable differences were noted.

Incubator flows were set at a 5 gallon per minute rate, and incubators were loaded at 2,000 cc, or approximately 8,000 eggs per tray. If space allowed, 1,500 to 1,800 cc of eggs per tray were utilized. The eggs were treated with 1,667 ppm of formalin for 15 minutes starting 3 days after fertilization and continuing on a daily basis until the eggs started to hatch.

Eggs eyed-up at approximately 600 thermal units (TU) and were then shocked, picked, and enumerated. Hatching began at approximately 925 TU.

FISH PRODUCTION

Early Rearing

Fry were sent out to the concrete vats approximately three days prior to initial feeding. Initial feeding begins between 1,750 and 1,775 TU. Flows for the vats are set at 80 gallons per minute and are loaded at 70,000 to 100,000 fish per vat, depending on the number of fish on hand. The vats start at half length and are extended to full length when the density index (DI) reaches 0.30 to 0.35, usually around mid-February.

Beginning growth rates are slow, only 0.003-inch to 0.004-inch per day, due to cold water temperatures of only 37°F to 39°F. The fry are started on Bio-Diet #2 and #3 feed and remain on #3 until they reach 700 fish per pound. Bio-Diet feed has been used successfully at McCall Hatchery using modified feed rates. The conversion rates average 1.1:1 to 1.5:1 during the fry rearing stage.

Fish are moved to the outside rearing ponds the first week of June. They are adipose clipped and enumerated as they are moved out. The ponds are loaded at 563,282 into pond #1 and 544,094 into pond #2. Pond #2 received 303,906

adipose clipped and 240,188 left ventral (LV) fin clipped fish. The LV clipped fish are for supplementation research. The CWT will be done in the fall when the fish are larger (Appendix J).

The fish were fed three medicated feed treatments of Gallimycin, two at 4.5 grams of active erythromycin phosphate per 100 pounds of fish at 2% body weight, and one feed treatment of 9% grams active erythromycin phosphate per 100 pounds of fish at 1% body weight (Explained further in disease section).

FISH HEALTH

Diseases Encountered and Treatment

McCall Hatchery experienced losses in the 1992 South Fork Salmon River chinook during the month of August. Higher rearing densities might have predisposed the population to an epizootic of aeromonads and pseudomonads. A ten-day treatment of Oxytetracycline (TM-50) had little effect on mortality. The scheduled Erythromycin prophylactic feeding for BKD did help reduce mortality. Shortly after completion of the Erythromycin medicated feed treatment, a marking crew entered the ponds and the subsequent stress triggered a chronic mortality. In December, fish with typical signs of BKD were found at the tail ends of the ponds. BKD was confirmed via the Fluorescent Antibody Test (FAT). A third Erythromycin treatment was given. Medicated feed (9.0% Gallimycin fed at 1%) was presented to the fish every other day for 21 treatment days. The feed was well accepted by the fish, and on non-treatment days, the fish were not fed. During application of the treatment, a scheduled pound count produced signs of Erythromycin toxicity (tetany). All signs of toxicity were absent by the seventh day post-treatment. The third Erythromycin treatment seemed to reduce the number of fish with clinical signs of BKD.

Organosomatic Index

Organosomatic index parameters may vary significantly from previous years because of the later date of the analysis. The tetany observed during the third Erythromycin treatment was easily managed by not handling the fish. The benefits of treatment certainly outweighed detrimental effects of treatment. Hatchery observations noted increases in mortality on treatment days. This may be due to a toxic event in moribund fish, or possibly the excitement of feeding is deleterious to compromised fish. Upon completion of the treatment, BKD seemed to disappear from these ponds. It will be interesting to track the survival rates of these fish. This will help in deciding how much benefit Erythromycin treatment of fish populations exhibiting clinical signs of BKD will have on survival rates. At the pre-release sample, these fish appeared normal.

FISH MARKING

The fish marking crew was here three different times during the production cycle for the brood year 1992 summer chinook. The initial adipose and ventral fin marking was done the first week of June. The fish averaged 425 fish per pound and included a total of 777,619 fish. This is the first year that the fish were marked prior to ponding. They were cycled from the vats, through the marking trailer, and to the outside rearing ponds.

The fish were too small to CWT in the spring so the marking crew returned the third week of September and tagged approximately 330,000 fish with CWT in pond #1.

The crew returned in the early spring prior to release and PIT-tagged 5,100 fish. A portion of these fish were tagged by Russ Kiefer and crew and the rest by the regular marking crew in the PIT tag van. The breakdown of tagged released fish appears in Appendix J.

FISH DISTRIBUTION

The brood year 1992 smolt hauling operation was originally scheduled to begin on April 6, 1994 with the release of the supplementation fish, but was delayed until April 9 by the National Marine Fisheries Service permit process. Jerry McGehee brought down a crew and three trucks to assist with the hauling operation. There were 20 loads of fish hauled in 2 days, consisting of 1,058,563 fish. The rest of the general production fish were all released by April 13. There were four groups of 400 PIT-tagged fish for the time of release study that went out on April 12 (during a storm event), April 14 (during a non-storm event), April 22 (during a storm event), and April 28 (during a non-storm event) (Appendix E).

EXPERIMENTS

There are two ongoing experiments carried over to the brood year 1992 chinook. The first is a continuation of the supplementation research. This project is designed in an attempt to generate more returning adults to natural spawning grounds. Supplementation smolts are the prodigy of unmarked adults. These fish were isolated within the hatchery until they could be differentially marked to insure that genetic crossover with hatchery production fish would not occur. When these fish return as adults, a portion will be kept for spawning purposes to continue this program. There were 235,939 smolts released in the supplementation group that received an left ventral (LV) clip. These fish were released earlier than the normal production group. An additional 499 LV-clipped fish containing PIT tags were released in conjunction with the supplementation group.

The other project continued with 1992 smolts is the time of release experiment. There were four groups of 400 PIT-tagged fish released at different times during storm events and non-storm events. The first group was released with the main production group on April 12 during a storm event. When the weather cleared on April 14, the second group was released. The third group was released during a storm event on April 22, and the last group during a non-storm event on April 28 (Appendix E). The survival varied from 38.3% to 24.5%, and the travel times from 29.7 days to 20.2 days for the experimental groups based on PIT tag data at Lower Granite Dam. The general production group projected survival at 35.3% with an average travel time of 31 days. The survival rates could be compromised as the dams were spilling during this time. Group 1, released on April 12, had a travel time of 29.1 days with a survival rate of 38.3%. For group 2, released on April 14, travel time was 20.2 days with a survival rate of 33.3%. Group 3 was released on April 22 with an average travel time of 28.3 days and a survival rate of 24.8%. The fourth and final group, released on April 28, had a travel time of 27.6 days and a survival rate of 24.5%. The survival rates and travel time are reflected by arrival at Lower Granite Dam.

CONCLUSIONS

The brood year 1992 summer chinook released from McCall Hatchery were in good condition at release time. The overall survival rate to Lower Granite Dam was estimated at 35.3% based on rising PIT tag recoveries at the dam. This rate was lower than the past year, but the dams were spilling during the period and survival rates could be higher than estimated. The fish were smaller, 26 fish per pound as opposed to 17 to 19 fish per pound last year. The rearing density was also higher as there were 450,000 more fish on hand for the 1992 brood year compared to 1991 brood year. The release pipe and tempering pump were utilized again this year. The fish transport and stocking went smoothly with the assistance of the Clearwater Hatchery crew.

RECOMMENDATIONS

Low phosphate feed with a higher vitamin pack was utilized during the peak rearing cycle with no adverse effects noted. All of the chinook eggs that tested positive for BKD were culled this past year as there was a surplus of eggs (brood year 1993). It is recommended that this practice be continued if sufficient eggs are available. It would also be an improvement if the spawning area was expanded and a spawning table was developed to streamline operations.

A P P E N D I C E S

Appendix A-1. Lengths of brood year 1992 fish trapped.

Fork Length (cm)		Males	Females
36		1	0
37		0	0
38		0	0
39		1	0
40		1	0
41		1	0
42		1	0
43		2	0
44		1	0
45		4	0
46		4	0
47		8	0
48		5	0
49		5	0
50		13	0
51		16	0
52		15	0
53		11	0
54		15	0
55		13	0
56		9	0
57		7	0
58		4	1
59		7	0
60		7	0
61		5	0
62		5	0
63		7	0
64		8	0
65		12	0
66	205*	17	0
67		25	0
68		32	5
69		40	7
70		46	5
71		58	14
72		61	27
73		109	32
74		97	49
75		126	64
76		122	96
77		113	120
78		102	128
79		114	123
80		105	140
81		74	110
82		71	63
83		43	48
84		47	38
85		34	15
86		27	10
87		28	13
88		12	6
89		16	1
90		5	2
91		4	2
92		1	1
93		3	2
94		1	0
95		2	0
96		1	0
97		0	0
98		2	0
99		0	0
100		0	0
Totals**	1,521***	1,726	1,122

* Total jacks.

** These totals reflect lengths taken at trapping prior to first sort.

*** Total males not including jacks.

Appendix A-2. Lengths of brood year 1992 fish ponded.

Fork Length (cm)		Males	Females
36		0	0
37		0	0
38		0	0
39		0	0
40		0	0
41		1	0
42		0	0
43		2	0
44		0	0
45		1	0
46		2	0
47		4	0
48		3	0
49		3	0
50		3	0
51		14	0
52		1	0
53		1	0
54		7	0
55		5	0
56		0	0
57		2	0
58		0	0
59		1	0
60		2	0
61		2	0
62		3	0
63		4	0
64		8	0
65		8	0
66	87*	10	0
67		14	0
68		15	3
69		27	4
70		21	3
71		38	10
72		42	15
73		60	16
74		53	28
75		73	37
76		45	45
77		44	65
78		47	60
79		57	47
80		35	64
81		21	43
82		23	19
83		13	15
84		15	8
85		8	5
86		4	3
87		6	7
88		2	0
89		1	0
90		0	1
91		1	0
92		0	0
93		1	1
94		0	0
95		0	0
96		0	0
97		0	0
98		1	0
99		0	0
100		0	0
Totals**	667***	754	499

* Total jacks.

** These totals reflect lengths taken at trapping prior to first sort.

*** Total males not including jacks.

Appendix A-3. Lengths of brood year 1992 fish released.

Fork Length (cm)	Males	Females
36	1	0
37	0	0
38	0	0
39	1	0
40	1	0
41	0	0
42	1	0
43	0	0
44	1	0
45	3	0
46	2	0
47	4	0
48	2	0
49	2	0
50	10	0
51	2	0
52	14	0
53	10	0
54	8	0
55	8	0
56	9	0
57	5	0
58	4	1
59	6	0
60	5	0
61	3	0
62	2	0
63	3	0
64	0	0
65	4	0
66	7	0
67	11	0
68	17	2
69	13	3
70	25	2
71	20	4
72	19	12
73	49	16
74	44	21
75	53	27
76	77	51
77	69	55
78	55	68
79	57	76
80	70	76
81	53	67
82	48	44
83	30	33
84	32	30
85	26	10
86	23	7
87	22	6
88	10	6
89	15	1
90	5	1
91	3	2
92	1	1
93	2	1
94	1	0
95	2	0
96	1	0
97	0	0
98	1	0
99	0	0
100	0	0
Totals**	854***	623

* Total jacks.

** These totals reflect lengths taken at trapping prior to first sort.

*** Total males not including jacks.

Appendix B. South Fork Salmon River run timing, brood year 1992.

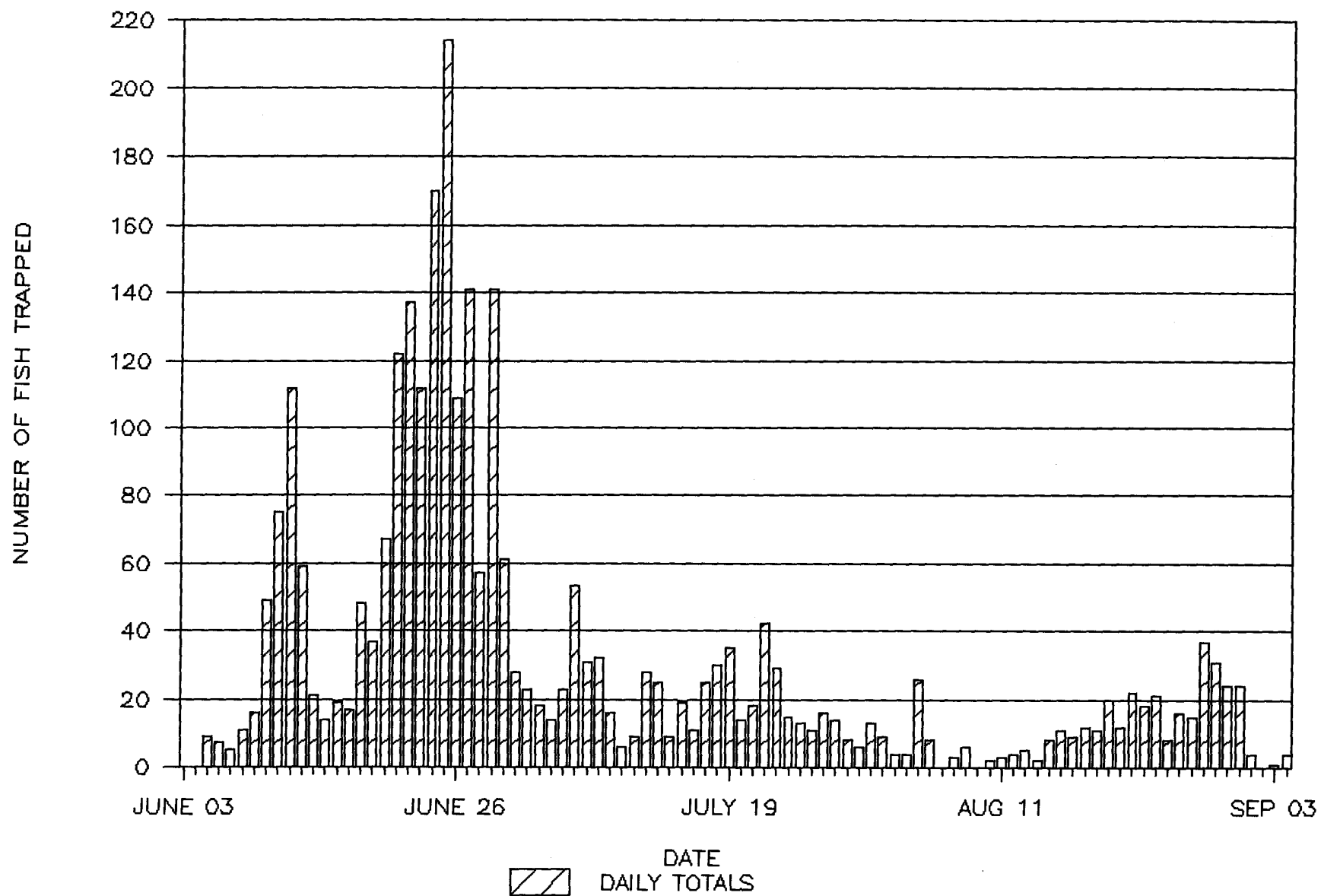
Date	Total Run	Males	Females	Jacks
Jun 03	0	0	0	0
Jun 04	0	0	0	0
Jun 05	9	3	6	0
Jun 06	7	3	4	0
Jun 07	5	9	0	2
Jun 08	11	10	0	1
Jun 09	16	6	10	0
Jun 10	49	28	19	2
Jun 11	75	43	28	4
Jun 12	112	75	31	6
Jun 13	59	46	13	0
Jun 14	21	14	6	1
Jun 15	14	8	6	0
Jun 16	19	9	10	0
Jun 17	17	7	10	0
Jun 18	48	33	15	0
Jun 19	37	23	11	3
Jun 20	67	42	24	1
Jun 21	122	70	50	2
Jun 22	137	65	64	8
Jun 23	112	56	47	9
Jun 24	170	94	74	2
Jun 25	214	126	77	11
Jun 26	109	55	47	7
Jun 27	141	65	69	7
Jun 28	57	26	27	4
Jun 29	141	70	61	10
Jun 30	61	30	30	1
Jul 01	28	17	11	0
Jul 02	23	11	9	3
Jul 03	18	7	9	2
Jul 04	14	7	4	3
Jul 05	23	9	14	0
Jul 06	53	23	26	4
Jul 07	31	15	14	2
Jul 08	32	16	15	1
Jul 09	16	8	8	0
Jul 10	6	1	5	0
Jul 11	9	5	4	0
Jul 12	28	11	14	3
Jul 13	25	15	9	1
Jul 14	9	5	2	2
Jul 15	19	8	10	1
Jul 16	11	6	2	3
Jul 17	25	12	12	1
Jul 18	30	18	7	5
Jul 19	35	18	13	4
Jul 20	14	2	8	4
Jul 21	18	8	6	4
Jul 22	42	18	13	11
Jul 23	29	12	9	8
Jul 24	15	8	3	4
Jul 25	13	2	10	1
Jul 26	11	3	6	2
Jul 27	16	8	5	3
Jul 28	14	5	4	5
Jul 29	8	5	3	0
Jul 30	6	3	2	1
Jul 31	13	2	6	5

Appendix B. Continued.

Date	Total Run	Males	Females	Jacks
Aug 01	9	6	0	3
Aug 02	4	3	0	1
Aug 03	4	1	1	2
Aug 04	26	14	8	4
Aug 05	8	4	2	2
Aug 06	0	0	0	0
Aug 07	3	1	1	1
Aug 08	6	3	3	0
Aug 09	0	0	0	0
Aug 10	2	2	0	0
Aug 11	3	2	0	1
Aug 12	4	2	0	2
Aug 13	5	4	1	0
Aug 14	2	1	1	0
Aug 15	8	3	2	3
Aug 16	11	8	2	1
Aug 17	9	6	3	0
Aug 18	12	5	6	1
Aug 19	11	8	2	1
Aug 20	20	13	6	1
Aug 21	12	6	4	2
Aug 22	22	17	3	2
Aug 23	18	16	2	0
Aug 24	21	18	2	1
Aug 25	8	5	3	0
Aug 26	16	12	2	2
Aug 27	15	13	0	2
Aug 28	37	19	15	3
Aug 29	31	15	13	3
Aug 30	24	8	14	2
Aug 31	24	4	19	1
Sep 01	4	1	2	1
Sep 02	0	0	0	0
Sep 03	1	1	0	0
Sep 04	4	3	1	0
Totals*	2,848	1,521	1,122	205

* The totals shown are from the daily trap sheet, prior to first sort. There were 29 females misidentified to bring totals to 1492 males, 1151 females, females, and 205 jacks according to length frequency.

SOUTH FORK SUMMER CHINOOK RUN 1992



Appendix D. Historic hatchery releases and returns.

Brood year	Release Year	Number of fish	3-year-olds	Year returned	4-year-olds	Year returned	5-year-olds	Year returned	Percent returned
1978	1980	124,800	124	1981	462	1982	161	1983	0.598
1979	1981	248,926	48	1982	272	1983	221	1984	0.217
1980	1982	122,247	504	1983	713	1984	151	1985	1.119
1981	1983	183,896	595	1984	1259	1985	203	1986	1.119
1982	1984	269,880	828	1985	1265	1986	202	1987	0.850
1983	1985	564,405	1222	1986	2117	1987	893	1988	0.674
1984	1986	970,348	386	1987	1392	1988	191	1989	0.255
1985	1987	958,300	50	1988	252	1989	30	1990	0.035
1986	1988	1,060,400	495	1989	911	1990	154	1991	0.147
1987	1989	975,000	28	1990	237	1991	25	1992	0.029
1988	1990	1,032,500	821	1991	2617	1992	1311	1993	0.030
1989	1991	708,600	206	1992	1364	1993	0	1994	
1990	1992	901,500	28	1993	0	1994	0	---	---
1991	1993	607,298	0	1994	0	1995	0	---	---
1992	1994	1,060,163	0	1995	---	---	---	---	---

Appendix E. Summer chinook distribution in the South Fork of the Salmon River.

Destination	Weight	Number/pound	Number released
Knox Bridge	19,320.0	26.90	519,710
Knox Bridge	21,283.0	25.32	538,890
Knox Bridge	15.7	25.32	399
Knox Bridge	15.7	25.32	399
Knox Bridge	15.8	25.32	400
Knox Bridge	14.4	25.34	365
Total Released	40,665.0		1,060,163

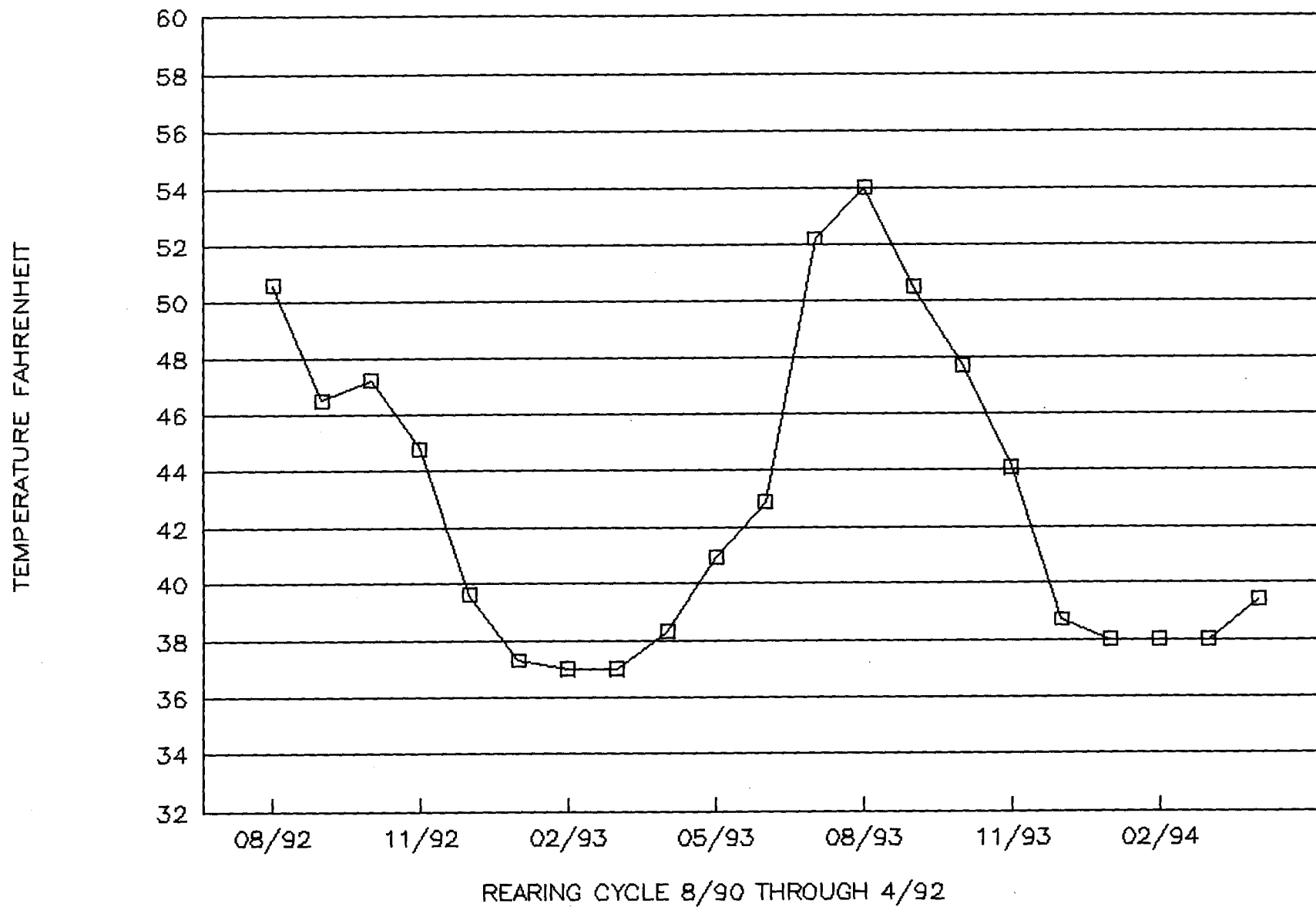
Appendix F. Brood year 1992 chinook survival from green eggs to released smolts.

Number of green eggs	Number of eyed eggs	Percent Survival	Ponded	Percent survival	Released smolts	Percent survival
1,428,819	1,220,600	86%	1,107,376	77.5	1,060,163	74.2%

Appendix G-1. Temperature range from August 1991 through April 1993.

Date	Temperature
08/92	50.6
09/92	46.5
10/92	47.2
11/92	44.8
12/92	39.6
01/93	37.3
02/93	37.0
03/93	37.0
04/93	38.3
05/93	40.9
06/93	42.9
07/93	52.2
08/93	54.0
09/93	50.5
10/93	47.7
11/93	44.1
12/93	38.7
01/94	38.0
02/94	38.0
03/94	38.0
04/94	39.4

Appendix G-2. Temperature range graph through rearing cycle.



Appendix H. Water analysis.

Date	pH	Ammonia	Nitrate	Nitrite	Total phosphate	Total nitrogen	KJEL hardness	CaCO ₂ saturation	Oxygen ppm
1988	6.8	-	-	-	-	-	<10	97/103	7/10
1991		<0.05	<0.1	<0.1	<0.05	<0.10			
1993	6.9	<0.05	<0.1	<0.01	<0.05	<0.10			

Appendix I. Brood year 1991 production cost table.

Number of fish	Pounds of feed	Cost of feed	Pounds of fish	Conversion	Total cost	Cost/1,000	Cost/pound
1,060,163	45,921	\$51,800	40,665	1.13	\$359,400	\$359.40	\$8.84

Appendix J. Brood year 1992 marked fish that were released.

Date	Number of fish marked	Mark	Purpose	Number marked fish released	Site/group release
06/1-6/11	303,906	AD	Identification	283,771	1,060,163
06/1-6/11	240,188	LV	Supplementation	235,939	1,060,163
06/1-6/11	233,025	AD	Identification	211,287	1,060,163
9/22-9/24	330,114	AD/CWT	US-Canada	327,603	1,060,163
3/12	1,600	PIT	Time/Release	1,563	1,060,163
3/12	3,000	PIT	General Production	2,945 *	1,060,163
3/12	500	PIT	Supplementation	499 *	1,060,163
Total	1,112,333			1,060,163	1,060,163

* Included in ad-clip and supplementation groups.

Appendix K: Summary of fish autopsies.

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 94-141	LOCATION: mc
SPECIES: su	AUTOPSY DATE: 03/22/94
STRAIN: sf	AGE: juv
UNIT:	SAMPLE SIZE: 60
REASON FOR AUTOPSY: preliber	
INVESTIGATOR(S): munson,ball	
REMARKS:	

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL**	0.00	0.00	0.00
HEMATOCRIT	44.98	4.33	0.10
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	8.37	1.41	0.17

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

		PSEUDO-				MESEN.		HIND					
EYES	GILLS	BRANCHES	THYMUS	FAT	SPLEEN	GUT	KIDNEY	LIVER	BILE				
N 60	N 60	N 60	0 60	0 0	B 60	0 60	N 59	A 0	0 60				
B1 0	F 0	S 0	1 0	1 1	R 0	1 0	S 1	B 59	1 0				
B2 0	C 0	L 0	2 0	2 17	G 0	2 0	M 0	C 0	2 0				
E1 0	M 0	S&L 0		3 28	NO 0		G 0	D 0	3 0				
E2 0	P 0	I 0		4 14	E 0		U 0	E 0					
H1 0	OT 0	OT 0	$\bar{X} = 0.00$		OT 0	$\bar{X} = 0.00$	T 0	F 0					
H2 0	0	0		$\bar{X} = 2.93$				OT 1	$\bar{X} = 0.00$				
M1 0													
M2 0													
OT 0													

SUMMARY OF NORMALS

60	60	60	60	60	60	60	60	59	59	60
SEX	M:	0	F:	0	U:	6				

GENERAL REMARKS

FINS:	GONADS:
SKIN:	OTHER:


Submitted by:


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Fish Hatchery Superintendent III

Doug Munson
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Approved by:

IDAHO DEPARTMENT OF FISH AND GAME


Steven M. Huffaker, Chief
Bureau of Fisheries


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